

WHAT IS CLAIMED IS:

- 2 1. A microfluidic device for assaying a liquid biological sample of 10 μ L or
less, said device including at least one space in which a reagent or conditioning agent is
4 immobilized on a substrate, the improvement comprising a microstructure disposed in
said space for directing said sample over said substrate containing said reagent in a
6 predetermined uniform manner and purging air from said space.
- 8 2. A microfluidic device of Claim 1 wherein said microstructure is a uniform
array of posts having more than one column of posts disposed at a right angle to the flow
10 of said sample.
- 12 3. A microfluidic device of Claim 2 wherein said microstructure has a
second column of posts adjacent to a first column of posts, said posts of said second
14 column positioned between the posts of said first column, thereby preventing said sample
liquid from flowing in a straight line through said space.
- 16 4. A microfluidic device of Claim 2 wherein said posts have at least one
18 wedge-shaped cutout aligned vertically to said substrate for facilitating movement of the
sample liquid onto said substrate.
- 20 5. A microfluidic device of Claim 1 wherein said microstructure is
22 positioned above said substrate.
- 24 6. A microfluidic device of Claim 1 wherein said microstructure contacts
said substrate.
- 26 7. A microfluidic device of Claim 1 wherein said microstructure is a ramp
28 for directing flow upward or downward to a substrate disposed on a plateau.
- 30 8. A microfluidic device of Claim 1 wherein said microstructure is a groove
or weir disposed perpendicularly to the direction of sample flow.
32

9. A method of distributing a liquid sample of 10 μ L or less uniformly over a reagent or conditioning agent immobilized on a substrate in a well of a microfluidic device comprising passing said sample through a microstructure, said microstructure facilitating movement of said sample in a predetermined uniform manner onto said substrate and purging air from said well.

10. A method of Claim 9 wherein said microstructure is a uniform array of posts disposed at a right angle to sample flow.

11. A method of Claim 10 wherein said microstructure has a second column of posts adjacent to a first column of posts, said posts of said second column positioned between the posts of said first column, thereby preventing said liquid sample from flowing in a straight line over said substrate.

12. A method of Claim 10 wherein said posts have at least one wedge-shaped cutout aligned vertically to said substrate for facilitating movement of said liquid onto said substrate.

13. A method of Claim 9 wherein said microstructure is positioned above said substrate.

14. A method of Claim 9 wherein said microstructure contacts said substrate.

15. A method of Claim 9 wherein said microstructure is a ramp for directing flow upward to a substrate disposed on a plateau.

16. A method of Claim 9 wherein said microstructure is a groove or weir disposed perpendicularly to the direction of sample flow.

17. A microfluidic device for assaying a liquid biological sample of 10 μ L or
2 less comprising

- (a) an inlet port for receiving said sample;
- 4 (b) a capillary passageway in fluid communication with said inlet port;
- (c) a metering capillary or metering well in fluid communication with the
6 capillary passageway of (b), thereby permitting said sample to flow into said metering
capillary or metering well;
- 8 (d) at least one conditioning well containing a reagent for conditioning said
sample;
- 10 (e) at least one capillary passageway in fluid communication with said
conditioning well of (d) and said metering capillary or metering well of (c);
- 12 (f) at least one reagent well for contacting said sample after conditioning
with a reagent for assaying the amount of an analyte in said sample, said reagent well
14 containing a reagent disposed on a substrate and microstructures for passing said sample
over said substrate in a predetermined uniform manner and purging air from said well.

16

18. A microfluidic device of Claim 17 wherein said microstructure is a
18 uniform array of posts disposed at a right angle to the flow of said sample.

20. A microfluidic device of Claim 17 wherein said microstructure is a ramp
containing at least one groove for directing flow upward to the substrate, and substrate
22 being disposed on a plateau.

24. A microfluidic device of Claim 17 wherein said microstructure is a
groove or weir disposed perpendicularly to sample flow.

26

21. A microfluidic device for assaying a biological sample comprising an
28 absorbent substrate strip having an inlet end and an outlet end and containing a sequence
of reagents on said for reaction with said sample, wherein said sample is in contact with
30 said inlet end of said strip and said outlet end of said strip is in contact with an absorbent
material for removing liquid from said outlet end.

32

22. A microfluidic device of Claim 21 wherein said inlet end of said strip
34 extends into a pre-chamber for holding said sample.

23. A microfluidic device of Claim 21 wherein said inlet end of said strip is
2 on a plateau above a pre-chamber for holding said sample and a wall containing at least
one groove extends from said sample in said pre-chamber to said plateau.

4

24. A microfluidic device for assaying the amount of glucose in a sample of
6 blood comprising

(a) an entry port for receiving said sample;

8 (b) an inlet passageway containing ridges or grooves disposed
perpendicularly to the sample flow to create a uniform liquid front, said passageway
10 widening into a reagent chamber;

(c) said reagent chamber of (b) containing microstructures and a chromagenic
12 glucose reagent disposed on a porous substrate; and

(d) a vent passageway in communication with said reagent chamber for
14 venting air displaced from said reagent chamber.

16 25. A microfluidic device of Claim 24 wherein said microstructures of (c) are
a uniform array of posts having more than one column of posts disposed at a right angle
18 to the flow of said sample.

20 26. A microfluidic device of Claim 25 wherein said posts have at least one
wedge-shaped cutout aligned vertically to said substrate for facilitating movement of said
22 sample toward said substrate.